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Cooperative hydration effect on the binding of organic vapors by a cross-linked polymer and beta-cyclodextrin

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Abstract

A cooperative hydration effect being favorable for the binding of organic vapors by cross-linked poly(N-6-aminohexylacrylamide) and beta-cyclodextrin was observed in ternary systems in the absence of liquid phase. For these systems the vapor sorption isotherms were determined by the static method of headspace gas Chromatographic analysis at 298 K. The obtained isotherms show an increase of binding affinity for vapor of hydrophobic sorbates above a threshold value of receptor hydration. Further hydration gives a saturation of this affinity for the studied hydrophilic polyacrylamide derivative, while the affinity of beta-cyclodextrin for the hydrophilic sorbate ethanol even decreases. A similar behavior of this polymer and beta-cyclodextrin at the change of their hydration helps to explain the observed cooperative hydration effect in terms of clathrate formation.

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Keywords

Clathrate formation, Cooperative hydration effects, Headspace GC analysis, Macromolecular receptor, Vapor sorption isotherms